

What is claimed is:

1. A liquid feed electrochemical fuel cell comprising:

- 5 (a) a first electrode having first and second oppositely facing major surfaces, said first electrode comprising a porous sheet material having a thickness and a quantity of catalyst distributed through the thickness of the porous sheet material between said major surfaces, and  
10 said first major surface has a first major surface hydrophilicity, and said second major surface has a second major surface hydrophilicity;
- (b) a second electrode;
- 15 (c) an ion-exchange membrane interposed between said second major surface of said first electrode and said second electrode;

wherein said first electrode is fluidly connected  
20 to a source of liquid reactant and the first surface hydrophilicity is greater than the second major surface hydrophilicity.

2. A liquid feed electrochemical fuel cell according to claim 1 wherein said second major surface of said first electrode comprises a hydrophobic polymer.

3. A liquid feed electrochemical fuel cell according to claim 1 wherein said first major surface of said first electrode comprises a hydrophilic polymer.

4. A liquid feed electrochemical fuel cell comprising:

- 5 (a) a first electrode having first and second oppositely facing major surfaces and a porous volume between said major surfaces, said first electrode comprising a sufficient quantity of catalyst concentrated at said first major surface and disposed between said major surfaces within the volume of said first electrode so that a reactant introduced to said first major surface of said first electrode is substantially completely reacted upon contacting said second major surface of said first electrode;
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- 15 (b) a second electrode;
- (c) an ion-exchange membrane interposed between said second major surface of said first electrode and said second electrode, and said second major surface of said first electrode is adjacent the ion-exchange membrane.
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5. A liquid feed electrochemical fuel cell according to claim 4 wherein said first electrode comprises a porous electrically conductive sheet

material which defines said volume, and said sheet  
5 material comprises carbon fiber paper.

6. A liquid feed electrochemical fuel cell  
comprising:

- 5 (a) a first electrode having first and second  
oppositely facing major surfaces, said  
first electrode comprising a porous sheet  
material and a quantity of catalyst  
concentrated at said first and second  
major surfaces of said first electrode,  
said quantity of catalyst being  
10 sufficient so that a reactant introduced  
to said first major surface of said first  
electrode is substantially completely  
reacted upon contacting said second major  
surface of said first electrode;
- 15 (b) a second electrode;
- (c) an ion-exchange membrane interposed  
between said first electrode and said  
second electrode.

7. A liquid feed electrochemical fuel cell  
according to claim 6 wherein catalyst particles are  
impregnated into both major surfaces.

8. A liquid feed electrochemical fuel cell  
comprising:

- 5 (a) a first electrode having first and second  
oppositely facing major surfaces, said  
first electrode comprising at least one

- active layer, said at least one active layer comprising a porous sheet material having a volume and catalyst particles, and said first electrode further
- 10 comprising a plurality of inactive layers, and each of said at least one active layer is disposed between two inactive layers;
- (b) a second electrode;
- 15 (c) an ion-exchange membrane interposed between said first electrode and said second electrode.

9. The liquid feed fuel cell of claim 8, wherein said active layer has a volume and the catalyst particles are disposed throughout the volume of said active layer.

10. The liquid feed fuel cell of claim 8, wherein said first and second major surfaces of said first electrode are defined by said inactive layers.

11. A liquid feed electrochemical fuel cell comprising:

- (a) a first electrode having first and second oppositely facing major surfaces, said
- 5 first electrode comprising a plurality of layers having oppositely facing major planar surfaces, and each layer comprises porous sheet material and catalyst

10 particles disposed at both of said major  
planar surfaces of each layer;

(b) a second electrode;

(c) an ion-exchange membrane interposed  
between said first electrode and said  
second electrode.

12. A liquid feed fuel cell according to  
claim 11, wherein said first electrode comprises at  
least four of said layers.

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13. A liquid feed electrochemical fuel cell  
comprising:

(a) a first electrode having first and second  
oppositely facing major surfaces, said  
5 first electrode comprising a plurality of  
active layers, and said active layers  
comprise catalyst particles and a porous  
sheet material having a thickness, and  
said first electrode further comprising  
10 at least one inactive layer, and said at  
least one inactive layer is disposed  
between two active layers;

(b) a second electrode;

(c) an ion-exchange membrane interposed  
15 between said first electrode and said  
second electrode.

14. The liquid feed fuel cell of claim 13,  
wherein said first electrode comprises at least  
three active layers.

15. The liquid feed fuel cell of claim 13, wherein said active layers comprise carbon cloth filled with a matrix of said carbon particles and polymeric binder.

16. The liquid feed fuel cell of claim 13, wherein said catalyst particles are distributed throughout the thickness of said active layers.

17. The liquid feed fuel cell of claim 13, wherein said first and second major surfaces of said first electrode are defined by said active layers.

18. The liquid feed fuel cell of claim 13, wherein said at least one inactive layer has oppositely facing major planar surfaces and has channels formed in said major planar surfaces.

19. The liquid feed fuel cell of claim 18, wherein said at least one inactive layer comprises carbon fiber paper.